Relative abundance of catfish species within the river channel

Expectation:	An increase in relative abundance of *Ictalurus punctatus* and concurrent decrease in relative numbers of *Ameiurus nebulosus* (brown bullhead).
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Date:	May 20, 1999; Revised June 2001.
Relevant Endpoint(s):	Restoration - Biological Integrity - Community Structure Restoration - System Functional Integrity - Habitat Quality
Baseline Conditions:	Channelization of the Kissimmee River altered both hydrologic and geomorphologic attributes of the river. Elimination of instream flow and seasonally fluctuating discharge have resulted in encroachment of emergent littoral vegetation and proliferation of floating vegetation, shallowing of remnant river runs through accumulation of dead and decomposing plant litter on the river bed, decreased dissolved oxygen levels, and elimination of over bank flow and accompanying connection of the river channel to floodplain habitats. These alterations and accompanying physical and chemical changes have caused a shift in catfish community structure. Post-channelization river channel fish communities were evaluated using hoopnets, block nets, and fish toxicant (5% emulsified rotenone). Baseline block net sampling indicates a community comprised of 19 large bodied species within remnant river runs in Pools A and C (Table 1). The community within pool A was dominated by gamefish (68.8%), followed by rough fish (24.2%), catfish (6%), and exotics (1%). The catfish community was dominated by *A. nebulosus* which accounted for 98.3% of annual catfish abundance. *Ameiurus natalis* represented 1.7% of annual catfish abundance. Community composition within pool C was dominated by gamefish (75.4%), followed by rough fish (13.8%), catfish (9.3%), and exotics (1.5%). The catfish community was dominated by *A. nebulosus* which accounted for 98.9% of catfish abundance. *Ictalurus punctatus* represented 1.1%of annual catfish abundance. Baseline hoopnet sampling within remnant river runs in Pools A and C indicates a community comprised of 15 large bodied species (Table 2). The community within pool A was dominated by gamefish (65.6%), followed by rough fish (10.9%), catfish (22.3%), and exotics (1.2%). The catfish community was dominated by *A. nebulosus* which accounted for 99.1% of catfish abundance, while *Ameiurus natalis* represented 0.9%. *Ictalurus punctatus* was not collected. Community composition within pool C was dominated by gamefish (56.6%), followed by rough fish (11.0%), catfish (22.0%), and exotics (1.4%). The catfish community was dominated by *A. nebulosus* (*A. nebulosus* 98.2%, *A. natalis* 1.8%). *Ictalurus punctatus* was not collected. Milleson (1976) utilized block nets and fish toxicant to sample a 0.20 acre reach of remnant river in Pool B following channelization. Results

showed a large bodied fish community heavily dominated in abundance by gamefish (96%). The catfish community consisted of 3 individuals of two species (*I. punctatus* and *A. nebulosus*)

Reference Conditions:

Historical data on river channel fish community structure of the Kissimmee River ecosystem are limited to a single study (FGFWFC 1957), in which river channel fish were sampled using block nets and 5% emulsified rotenone. Sampling was conducted within a lower reach of the Kissimmee River, during drought conditions. Community composition (Table 1) was dominated by catfish (85.9%), followed by gamefish (12.3%), and rough fish (1.7%). The dominance of catfish in the historic river may have been a sampling artifact, because only a single sample was collected. The catfish community was dominated in abundance by *I. punctatus* (*I. punctatus*: 98%, *A. nebulosus*: 1%, *Ameiurus catus* – white catfish: 1%). Ninety percent of the 300 *I. punctatus* collected were juveniles (≤10 cm total length).

Bass (1991) summarized electrofishing data collected by FGFWFC from 12 Florida rivers from 1983-1987. Due to anthropogenic alterations and zoogeography, these rivers are not ideal reference sites for the historic Kissimmee, but provide information on the composition of riverine fish communities within Florida. *Ictalurus punctatus* was among the numerically dominant species collected within the Peace River and comprised 4.6% of the total number of fishes sampled (small and large-bodied). No other catfish species were among the numerically dominant species in any of the rivers sampled.

Champeau (1990) found a positive correlation between *I. punctatus* relative abundance and improved water quality along a downstream gradient in the Peace River. Relative abundance of *I. punctatus* increased from 0.4% near the headwaters (21 km) to 12.7% 16 km north of the river's confluence into Charlotte Harbor.

Mechanism relating restoration:

Re-establishment of historic hydrologic characteristics will drive the restoration of river channel habitat. Re-establishment of flow will affect the abundance of catfish species by alteration of river channel vegetation communities (Lobb & Orth 1991, Sheldon & Meffe 1995). Seasonally high discharges will limit encroachment of littoral vegetation (Williams & Wolman 1984, Ligon et al. 1995) and reduce areal coverage of littoral vegetation communities along the river channel. *Ameiurus nebulosus* prefers vegetated habitats with low flow velocities (Lee et al. 1980). Increased flow velocities and decreased vegetative cover will likely lead to lateral migration of *A. nebulosus* onto floodplain habitats, thereby decreasing its abundance within the restored river channel.

Ictalurus punctatus prefers medium to large rivers with moderate to swift currents over sand substrates (Lee et al. 1980, Page & Burr 1991). Re-introduction of flow will flush accumulated organic deposits and uncover the historic sand substrate (Toth 1996). Continuous flow and re-established sand substrate will provide instream habitat conducive to an increase in abundance of *I. punctatus*.

Adjustments for External Constraints:

Ictalurus punctatus is a popular food fish targeted by commercial fisherman where populations are abundant (Mettee et al. 1996). Increased fishing pressure may affect the relative abundance of this species within the restored system.

Time Course:

Restructuring of the catfish community is dependent upon changes in hydrology, geomorphology, and associated biological, physical, and chemical attributes and is expected to occur within 3-6 years following re-establishment of continuous instream flows. Restoration time frames may require adjustment if appropriate hydrologic and geomorphologic characteristics are not met.

Reproduction rates, time periods necessary to reach sexual maturity, and limited numbers of *I. punctatus* within the system also will affect the predicted response. *Ictalurus punctatus* is a long-lived species (maximum age in southern climates is 15 years) and does not reach sexual maturity until 3-6 years (Carlander 1969, Mettee et al. 1996). Limited abundance (0.1% of total fish community in Pool C) of *I. punctatus* within the channelized system might increase projected response times by limiting their reproductive potential.

Means of Evaluation:

Block net sampling will be conducted following 3 years of continuous flows. Methods will be identical to those utilized for baseline studies. Two sampling events will occur during two years of minimal flow within 10 years of reintroduction of continuous flows. Hoopnet sampling will be conducted following 3 years of continuous flows. Methods will be identical to those utilized for baseline studies, with samples collected monthly for 1 year periods beginning the 4^{th}, 7^{th}, and 10^{th} year following reintroduction of continuous flow.

Samples will be analyzed for species composition, species richness, and relative abundance of functional groups. Differences in these data between pools will be determined using ANOVA.

Differences in relative abundance will be considered significant if statistical tests result in $P \leq 0.05$. Baseline values for comparisons of relative abundance of catfish species for block net sampling are 9.2 ($\pm$ 6.4) and 0.1 ($\pm$ 0.1) for *A. nebulosus* and *I. punctatus*, respectively. Baseline values for comparisons of relative abundance using hoopnet sampling are 22.4 (*A. nebulosus*) and 0 (*I. punctatus*).

Table 1. Large bodied fish species sampled within the Kissimmee River with block nets. Baseline values for fishes collected in Pools A and C are expressed as annual means with associated standard error.

Species	Common Name	GFC 1957	Milleson '76	Pool A '97-98	Pool C '97-98
GAME FISH:					
Lepomis gulosus	warmouth	0.8	15.7	20.1 ± 0.6	33.4 ± 8.5
Lepomis macrochirus	bluegill	7.3	52.6	28.7 ± 2.3	30.6 ± 6.8
Lepomis microlophus	redear sunfish	2.5	14.9	4.9 ± 0.2	2.7 ± 0.7
Lepomis punctatus	spotted sunfish	--	2.2	1.3 ± 0.7	2.1 ± 1.1
Micropterus salmoides	largemouth bass	1.7	5.8	4.4 ± 3.8	3.3 ± 2.7
Pomoxis nigromaculatus	black crappie	--	4.6	9.2 ± 5.4	3.2 ± 1.1
Esox niger	chain pickerel	--	--	0.2 ± 0.2	--
Esox americanus	redfin pickerel	--	--	--	0.1 ± 0.1
ROUGH FISH:					
Amia calva	bowfin	--	--	5.7 ± 1.1	2.6 ± 1.5
Erimyzon sucetta	lake chubsucker	1.7	0.3	3.7 ± 3.0	3.4 ± 1.5
Dorosoma cepedianum	gizzard shad	--	2.2	--	0.2 ± 0.2
Lepisosteus osseus	longnose gar	--	--	0.1 ± 0.1	--
Lepisosteus platyrhincus	Florida gar	--	0.7	14.7 ± 6.9	7.6 ± 1.6
CATFISH:					
Ameiurus catus	white catfish	0.8	--	--	--
Ameiurus natalis	yellow bullhead	--	--	0.1 ± 0.1	--
Ameiurus nebulosus	brown bullhead	0.8	0.3	5.9 ± 5.0	9.2 ± 6.4
Ictalurus punctatus	channel catfish	84.4	0.7	--	0.1 ± 0.1
EXOTIC FISH:					
Hoplosternum littorale	armored catfish	--	--	0.6 ± 0.6	0.1 ± 0.1
Oreochromis aureus	blue tilapia	--	--	0.1 ± 0.1	0.2 ± 0.2
Clarias batrachus	walking catfish	--	--	0.3 ± 0.3	1.2 ± 1.2

Table 2. Relative abundance of total numbers of fishes collected in hoopnet samples in Pools A and C of the channelized Kissimmee River. Sampling was conducted monthly between January and December 1998.

		Pool A	Pool C
GAME FISH:			
Centrarchidae (sunfishes)			
Lepomis gulosus	warmouth	0.6	0.5
Lepomis macrochirus	bluegill	38.4	36.1
Lepomis microlophus	redear sunfish	7.1	10.1
Lepomis punctatus	spotted sunfish	0.6	0.6
Micropterus salmoides	largemouth bass	3.5	3.4
Pomixis nigromaculatus	black crappie	15.2	14.2
Esocidae (pikes)			
Esox niger	chain pickerel	0.2	0.3
ROUGH FISH:			
Amiidae (bowfins)			
Amia calva	bowfin	0.8	2.6
Catostomidae (suckers)			
Erimyzon sucetta	lake chubsucker	6.0	6.6

Clupeidae (herrings)			
Dorosoma cepedianum	gizzard shad	2.7	0.6
Lepisosteidae (gars)			
Lepisosteus platyrhincus	Florida gar	11.0	1.0
CATFISH:			
Ictaluridae (bullhead catfishes)			
Ameiurus natalis	yellow bullhead	0.4	0.2
Ameiurus nebulosus	brown bullhead	21.6	22.4
EXOTICS:			
Callichthyidae (armored catfishes)			
Hoplosternum littorale	armored catfish	0.8	0.6
Cichlidae (cichlids)			
Oreochromis aureus	blue tilapia	0.6	0.5

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